We claim:

1. A hand held, self-contained, automatic sensor for detecting and quantifying the amount of an analyte in a sample, the sensor comprising:

power supply;

digital means for automatically controlling the operation of the sensor;

an external port for receiving the sample;

means for driving fluids in the sensor after the sample is received;

means for extracting the analyte from the sample; and

means for measuring the fluorescence of the extracted analyte to detect and quantify the amount of analyte in the sample.

2. The sensor as recited in claim 1, further comprising a self-contained module, the module being insertable into and removable from the sensor as a unit, the means for extracting the analyte being located in the module.

3. The sensor as recited in claim 1, further comprising means for providing the analyte with a measurable fluorescence when the analyte does not have a measurable natural fluorescence.

4. The sensor as recited in claim 3, further comprising a self-contained module, ~~the~~ module being insertable into and removable from the sensor as a unit, the means for extracting the analyte and the means for providing a measurable fluorescence being located in the module.

5. The sensor as recited in claim 1, wherein the means for extracting the analyte comprises an affinity column for binding and concentrating the analyte contained in the sample.

6. The sensor as recited in claim 5, wherein the means for extracting the analyte further comprises:

a first reservoir containing a fluid for rinsing the affinity column clean of any dissolved or suspended material other than the bound analyte; and

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a second reservoir containing an elution fluid for releasing the analyte from the affinity column.

7. The sensor as recited in claim 6, further comprising a self-contained module, the module being insertable into and removable from the sensor as a unit, the affinity column, the first reservoir and the second reservoir being located in the module.

8. The sensor as recited in claim 6, further comprising means for providing the analyte with a measurable fluorescence when the analyte does not have a measurable natural fluorescence.

9. The sensor as recited in claim 8, the means for providing a measurable fluorescence comprising a third reservoir containing a solution for providing the analyte with a measurable fluorescence, the solution being added to the analyte after the analyte leaves the affinity column.

10. The sensor as recited in claim 9, further comprising a self-contained module, the module being insertable into and removable from the sensor as a unit, the affinity column, the first reservoir, the second reservoir and the third reservoir being located in the module.

11. The sensor as recited in claim 9, wherein the solution comprises a developer for derivatizing the analyte to create a fluorescent tag.

12. The sensor as recited in claim 9, wherein the solution comprises a fluorescent tagged compound.

13. The sensor as recited in claim 9, further comprising means for mixing the solution and the analyte before the analyte enters the means for measuring the fluorescence.

14. The sensor as recited in claims 1, 3, 6 or 8, the means for measuring the fluorescence comprising:

a fluorometric cell for receiving the analyte to be detected;

means for illuminating the fluorometric cell with radiation;

a first optical system for collecting the radiation from the illuminating means and focusing the radiation on the fluorometric cell and the analyte therein;

a first filter positioned between the first optical system and the fluorometric cell for removing radiation received from the first optical system except primarily radiation within a specific band that excites fluorescence associated with the analyte thereby causing the analyte to emit a fluorescent light in the fluorometric cell;

a second optical system for collecting the radiation including the fluorescent light emitted by the analyte leaving the fluorometric cell and focusing the fluorescent light on a detector;

a second filter for passing only the fluorescent light emitted by the analyte; and

the detector for converting the fluorescent light emitted by the analyte into electrical current, the total charge of the current being proportional to the amount of fluorescent light that is input to the detector and to the concentration of the analyte in the sample.

15. The sensor as recited in claim 14, the means for measuring the fluorescence further comprising:

means for digitizing the charge of the current; and

means for displaying the charge of the current.

16. The sensor as recited in claim 14, further comprising a waste chamber for receiving the fluid for rinsing, the elution fluid and the analyte used to detect and quantify the amount of analyte in the sample, and for also receiving a solution used for washing the sensor after use.

17. The sensor as recited in claim 14, wherein the means for driving fluids comprises a peristaltic pump.

18. The sensor as recited in claim 14, wherein the fluorometric cell comprises a cuvette.

19. The sensor as recited in claim 14, wherein the means for illuminating comprises an arc lamp.

20. The sensor as recited in claim 14, wherein the detector comprises a photomultiplier tube.

21. The sensor as recited in claim 14, the means for measuring the fluorescence further comprising:

a first operational amplifier circuit having a low pass characteristic for receiving the charge of the current from the detector and converting the charge of the current into a pulse;

a circuit for tracking the output of the first operational amplifier, the circuit having a low pass characteristic, and for holding a value that is a maximum in response to the charge of the current received from the detector; and

means for digitizing and displaying the held value.

22. The sensor as recited in claim 21, the circuit for tracking and holding comprising:

a second operational amplifier circuit having a low pass characteristic; and

a switch, the switch when open holding the value that is the maximum in response to the charge of the current received from the detector and when closed sending the held value to the digitizing and displaying means.

23. The sensor as recited in claim 22, the first operational amplifier circuit comprising a transimpedance amplifier.

1 ~~24~~. A hand held, self-contained, automatic sensor for detecting and quantifying the amount of aflatoxin in a sample, the sensor comprising:

a power supply in the sensor;

digital means powered by the power supply for automatically controlling the operation of the sensor;

an external port for receiving the sample;

a peristaltic pump for driving fluids in the sensor after the sample is received;

an affinity column for binding and concentrating the aflatoxin contained in the sample;

a first reservoir containing a fluid for rinsing the affinity column clean of any dissolved or suspended material other than the bound aflatoxin;

a second reservoir containing an elution fluid for releasing the aflatoxin from the affinity column;

a fluorometric cuvette for receiving the elution fluid containing the aflatoxin to be detected;

an arc lamp for illuminating the fluorometric cuvette with radiation;

a first optical system for collecting the radiation from the arc lamp and focusing the radiation on the fluorometric cuvette and the elution fluid containing the aflatoxin therein;

an ultraviolet filter positioned between the first optical system and the fluorometric cuvette for removing radiation received from the first optical system except primarily radiation within a band in the near ultraviolet that excites fluorescence associated with the aflatoxin thereby causing the aflatoxin to emit a blue fluorescent light in the fluorometric cuvette;

a second optical system for collecting the radiation including the blue fluorescent light emitted by the aflatoxin in the fluorometric cuvette and focusing the blue fluorescent light on a photomultiplier tube;

a second filter for passing only the blue fluorescent light emitted by the aflatoxin;

a photomultiplier tube for converting the blue fluorescent light received from the second filter into electrical current, the total charge of the current being proportional to the amount of blue fluorescent light that is input to the

photomultiplier tube and to the concentration of the aflatoxin in the elution fluid;

a transimpedance amplifier having a low pass characteristic for converting the charge of the current from the photomultiplier tube into a pulse;

an operational amplifier circuit having a low pass characteristic for receiving the pulse from the transimpedance amplifier;

a switch, the switch when open holding a value that is a maximum in response to the pulse and when closed outputting the held value;

means for digitizing the held value; and

means for displaying the held value.

~~25. A hand held, self-contained, automatic fluorometer for detecting and quantifying the amount of an analyte present in a sample, the fluorometer comprising:~~

~~a power supply;~~

~~a fluorometric cell for receiving the sample containing the analyte to be detected;~~

~~means for illuminating the fluorometric cell with radiation;~~

~~a first optical system for collecting the radiation from the illuminating means and focusing the radiation on the fluorometric cell and the analyte therein;~~

~~a first filter positioned between the first optical system and the fluorometric cell for removing all radiation received from the first optical system except primarily radiation within a specific band that excites fluorescence associated with the analyte thereby causing the analyte to emit a fluorescent light in the fluorometric cell;~~

~~a second optical system for collecting the radiation including the fluorescent light emitted by the analyte leaving the fluorometric cell and focusing the fluorescent light on a detector;~~

a second filter for passing only the fluorescent light emitted by the analyte; and

a detector for converting the fluorescent light emitted by the analyte into electrical current, the total charge of the current being proportional to the amount of fluorescent light that is input to the detector and, therefore, to the concentration of the analyte in the sample, thereby permitting detection and quantification of the amount of analyte in the sample.

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26. The fluorometer as recited in claim 25, further comprising:

a first operational amplifier circuit having a low pass characteristic for converting the charge of the current from the detector into a pulse;

a circuit for tracking the output of the first operational amplifier, the circuit having a low pass characteristic, and for holding a value that is a maximum in response to the pulse; and

means for digitizing and displaying the held value.

3 ~~27~~. The fluorometer as recited in claim ~~26~~ 2, the circuit for tracking and holding comprising:

a second operational amplifier circuit having a low pass characteristic; and

a switch, the switch when open holding the value that is the maximum in response to the pulse and when closed sending the held value to the digitizing and displaying means.

4 ~~28~~. The fluorometer as recited in claim ~~27~~ 3, further comprising digital means for controlling the operation of the fluorometer.

29. A circuit for decoupling the output of a fluorometer from an electromagnetic interference generated by the fluorometer and for holding a value that is a maximum in response to the output of a detector of the fluorometer, the circuit comprising:

a first operational amplifier circuit having a low pass characteristic for converting an electrical current from the detector into a pulse; and

a circuit for tracking the output of the first operational amplifier, the circuit having a low pass characteristic, and for holding a value that is a maximum in response to the pulse.

30. The circuit as recited in claim 29, the circuit for tracking and holding comprising:

a second operational amplifier circuit having a low pass characteristic; and

a switch, the switch when open holding the value that is the maximum in response to the pulse and when closed outputting the held value.

31. The circuit as recited in claim 30, wherein the first operational amplifier circuit comprises a transimpedance amplifier.

32. A sensor for detecting and quantifying the amount of an analyte in a sample, the sensor comprising:

a hand held, enclosed container;

a power supply;

digital means for automatically controlling the operation of the sensor;

an external port in the container for receiving the sample;

means for driving fluids in the sensor after the sample is received;

means for extracting the analyte from the sample; and

means for measuring the fluorescence of the extracted analyte to detect and quantify the amount of analyte in the sample, the power supply, the digital means, the means for driving fluids, the means for extracting the analyte and the means for measuring the fluorescence being located in the container.

33. The sensor as recited in claim 32, further comprising means for providing the analyte with a measurable fluorescence when the analyte does not have a measurable natural fluorescence, the means for providing a measurable fluorescence being located in the container.

34. The sensor as recited in claim 32, wherein the means for extracting the analyte comprises an affinity column for binding and concentrating ~~the~~ analyte contained in the sample.

35. The sensor as recited in claim 34, wherein the means for extracting the analyte further comprises:

a first reservoir containing a fluid for rinsing the affinity column clean of any dissolved or suspended material other than the bound analyte; and

a second reservoir containing an elution fluid for releasing the analyte from the affinity column.

36. The sensor as recited in claim 35, the means for measuring the fluorescence comprising:

a fluorometric cell for receiving the analyte to be detected;

means for illuminating the fluorometric cell with radiation;

a first optical system for collecting the radiation from the illuminating means and focusing the radiation on the fluorometric cell and the analyte therein;

a first filter positioned between the first optical system and the fluorometric cell for removing radiation received from the first optical system except primarily radiation within a specific band that excites fluorescence associated with the analyte thereby causing the analyte to emit a fluorescent light in the fluorometric cell;

a second optical system for collecting the radiation including the fluorescent light emitted by the analyte leaving the fluorometric cell and focusing the fluorescent light on a detector;

a second filter for passing only the fluorescent light emitted by the analyte; and

a detector for converting the fluorescent light emitted by the analyte into electrical current, the total charge of the current being proportional to the amount of fluorescent light that is input to the detector and to the concentration of the analyte in the sample.

37. The sensor as recited in claim 36, the means for measuring the fluorescence further comprising:

means for digitizing the charge of the current; and

means for displaying the charge of the current.

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38. The sensor as recited in claim 36, the means for measuring the fluorescence further comprising:

a first operational amplifier circuit having a low pass characteristic for converting the electrical current from the detector into a pulse;

a circuit for tracking the output of the first operational amplifier, the circuit having a low pass characteristic, and for holding a value that is the maximum in response to the pulse; and

means for digitizing and displaying the held value.

6 ~~39~~. The sensor as recited in claim ~~38~~ 5, the circuit for tracking and holding comprising:

a second operational amplifier circuit having a low pass characteristic; and

a switch, the switch when open holding the value that is the maximum in response to the pulse and when closed sending the held value to the digitizing and displaying means.

40. The sensor as recited in claim 39, further comprising means for providing the analyte with a measurable fluorescence when the analyte does not have a measurable natural fluorescence, the means for providing a measurable fluorescence being located in the container.

41. A self-contained module for use in a sensor for detecting and quantifying the amount of an analyte in a sample, the module comprising:

a hand held, enclosed container, the container being insertable into and removable from the sensor as a unit; and

means for extracting the analyte from the sample, the means for extracting the analyte being located in the container.

42. The module as recited in claim 41, wherein the means for extracting the analyte comprises an affinity column for binding and concentrating the analyte contained in the sample.

43. The module as recited in claim 42, wherein the means for extracting the analyte further comprises:

a first reservoir containing a fluid for rinsing the affinity column clean of any dissolved or suspended material other than the bound analyte; and

a second reservoir containing an elution fluid for releasing the analyte from the affinity column.

44. The module as recited in claim 43, further comprising means for providing the analyte with a measurable fluorescence when the analyte does not have a measurable natural fluorescence, the means for providing a measurable fluorescence being located in the container.

45. The module as recited in claim 44, the means for providing a measurable fluorescence comprising a third reservoir containing a solution for providing the analyte with a measurable fluorescence, the solution being added to the analyte after the analyte leaves the affinity column.

46. A method for detecting and quantifying the amount of an analyte in a sample, the method comprising the steps of:

binding the analyte contained in the sample to antibodies for that analyte to extract the analyte from the sample;

rinsing the bound analyte to remove any dissolved or suspended material other than the bound analyte;

releasing the analyte using an elution fluid;

illuminating the analyte in the elution fluid with radiation in a specific band causing the analyte to emit a fluorescent light;

converting the fluorescent light into an electrical current, the charge of the current being proportional to the amount of fluorescent light and to the concentration of the analyte;

converting the charge of the current into a pulse;

decoupling the pulse from electromagnetic interference created during the illuminating step;

holding a value that is a maximum in response to the pulse; and

digitizing and displaying the held value to indicate the amount of the analyte present in the sample.

47. The sensor as recited in claim 6, further comprising a self-contained module, the module being insertable into and removable from the sensor as a unit, the first reservoir and the second reservoir being located in the module.

48. The sensor as ~~recited~~ in claim 6, further comprising a waste chamber for receiving the fluid for rinsing, the elution fluid, the analyte, and a solution used for washing the sensor after use.

49. The sensor as recited in claim 48, further comprising a self-contained module, the module being insertable into and removable from the sensor as a unit, the first reservoir, the second reservoir and the waste chamber being located in the module.

50. The sensor as recited in claim 9, further comprising a self-contained module, the module being insertable into and removable from the sensor as a unit, the first reservoir, the second reservoir and the third reservoir being located in the module.